Volume 58
(1996–1997)

Bulletin of Volcanology

Official Journal of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)

EXECUTIVE EDITOR

D. A. Swanson

ASSISTANT EXECUTIVE EDITOR

C. G. Newhall

EDITORIAL BOARD

S. Carey
Graduate School of Oceanography
University of Rhode Island
South Ferry Road
Narragansett, RI 02882-1197
USA
Fax: (001) 401-7926811
E-mail:
scarey@gsosun1.gso.uri.edu

M. R. Carroll
Geology Department
Bristol University
Bristol, BS8 1RJ, UK
Tel.: (0044) 117-9287794
Fax: (0044) 117-9253385
E-mail: mike.carroll@bristol.ac.uk

P. Einarsson
Science Institute
University of Iceland
Dunhaga 5
IS-107 Reykjavik
Iceland
Tel.: (00354) 5254816
Fax: (00354) 5528801
E-mail: palli@raunvis.hi.is

J. Fink
Department of Geology
Box 871404
Arizona State University
Tempe, Arizona 85287-1404
USA
Tel.: (001) 602-9653195
Fax: (001) 602-9658102
E-mail: aijhf@asuvm.inre.asu.edu

W. F. Giggenbach
Institute of Geological and Nuclear Sciences
P.O. Box 31312
Lower Hutt, New Zealand
Fax: (0064) 4-5704657
E-mail: w.giggenbach@gns.cri.nz

W. Hildreth
U.S. Geological Survey
MS 910
345 Middlefield Road
Menlo Park, CA 94025, USA
Fax: (001) 415-3295110
E-mail:
hildreth@mojave.wr.usgs.gov

T. Koyaguchi
Earthquake Research Institute
University of Tokyo
Tokyo 113, Japan
Fax: (0081) 3-38126979
E-mail: tak@eri.u-tokyo.ac.jp

J.-F. Lénat
Université Blaise Pascal-CNRS
Centre de Recherches Volcanologiques
5, rue Kessler
63038 Clermont-Ferrand,
France
Tel.: (0033) 73-346746
Fax: (0033) 73-346744
E-mail:
lenat@opgc.univ-bpclermont.fr

J. McPhie
Centre for Ore Deposit and Exploration Studies
University of Tasmania
GPO Box 252-79
Tasmania 7001
Australia
Fax: (0061) 03-62207662 or
(0061) 03-62232547
E-mail:
J.McPhie@geol.utas.edu.au

M. Rosi
Dipartimento di Scienze della Terra
Università di Pisa
Via S. Maria, 53
I-56100 Pisa, Italy
Fax: (0039) 50-500675
E-mail: rosi@dst.unipi.it

Springer

Bulletin of Volcanology was founded in 1922, as *Bulletin Volcanologique,* and is the official journal of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI). Beginning with Volume 48 (1986), published by Springer International and edited by H.-U. Schmincke and S. R. J. Sparks, and as of Volume 54 (1991/92) edited by H.-U. Schmincke and G. A. Mahood. From Volume 55 (1992/93) edited by H.-U. Schmincke, as of Volume 58 (1996/97) edited by D. Swanson.

Copyright

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out.

The author(s) transfer(s) the copyright to his/their article to Springer-Verlag effective if and when the article is accepted for publication. The copyright covers the exclusive and unlimited rights to reproduce and distribute the article in any form of reproduction (printing, electronic media or any other form); it also covers translation rights for all languages and countries. For U.S. authors the copyright is transferred to the extent transferable.

The author(s) guarantee(s) that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), all translation rights as well as the rights to publish the article in any electronic form. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA: Photocopies may be made for personal or inhouse use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0258-8900, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher. The Canada Institute for Scientific and Technical Information (CISTI) provides a comprehensive, world-wide document delivery service for all Springer-Verlag journals. For more information, or to place an order for a copyright-cleared Springer-Verlag document please contact Client Assistant, Document Delivery, CISTI, Ottawa K1A 0S2, Canada (Tel: 613-993-9251; Fax: 613-952-8243; e-mail: cisti.docdel@nrc.ca).

This journal is included in the Springer Journals Preview Service, i.e. the tables of contents and BiblioAbstracts are available via Internet several weeks before the new issue reaches the subscribers. Tables of contents are free of charge; BiblioAbstracts are available for a small annual fee. Details can be obtained by sending an e-mail message containing the line *„help"* to svjps@springer.de.

Printers

Zechnersche Buchdruckerei, D-67346 Speyer
© Springer-Verlag Berlin Heidelberg 1997
Printed in Germany

CONTENTS OF VOLUME 58 (1996–1997)

No. 1	1– 86	issued in September 1996
No. 2–3	87–248	issued in October 1996
No. 4	249–326	issued in November 1996
No. 5	327–420	issued in December 1996
No. 6	421–500	issued in April 1997
No. 7	501–582	issued in May 1997
No. 8	583–660	issued in July 1997

Adam CR → Gilbert JS 67
Alidibirov M, Dingwell DB: An experimental facility for the investigation of magma fragmentation by rapid decompression 411
Arai S → Toramaru A 393, 655
Barclay J → Stasiuk MV 117
Barker DS: Sillar ocioso 317
Bertagnini A, Landi P: The Secche di Lazzaro pyroclastics of Stromboli volcano: a phreatomagmatic eruption related to the Sciara del Fuoco sector collapse 239
Bilichenko AA → Taran YA 441
Black TM, Shane PAR, Westgate JA, Froggatt PC: Chronological and palaeomagnetic constraints on widespread welded ignimbrites of the Taupo volcanic zone, New Zealand 226
Bolognesi L: Comment on "Origin of the fumarolic fluids of Vulcano Island, Italy and implications for volcanic surveillance" by G. Chiodini, R. Cioni, L. Marini, and C. Panichi 319
Büttner R → Zimanowski B 491
Bursik MI, Woods AW: The dynamics and thermodynamics of large ash flows 175
Calder ES → Sparks RSJ 557
Calder ES, Sparks RSJ, Woods AW: Dynamics of co-ignimbrite plumes generated from pyroclastic flows of Mount St. Helens (7 August 1980) 432
Capaccioni B, Valentini L, Rocchi MBL, Nappi G, Sarocchi D: Image analysis and circular statistics for shape-fabric analysis: applications to lithified ignimbrites 501
Carroll MR → Stasiuk MV 117
Cashman KV → Klug C 87
Chiodini G, Cioni R, Frullani A, Guidi M, Marini L, Prati F, Raco B: Fluid geochemistry of Montserrat Island, West Indies 380
Chiodini G, Cioni R, Marini L, Panichi C: Reply to the comment by L. Bolognesi 321
Chiodini G, D'Alessandro W, Parello F: Geochemistry of gases and waters discharged by the mud volcanoes at Paternò, Mt. Etna (Italy) 51
Chiodini G, Frondini F, Raco B: Diffuse emission of CO_2 from the Fossa crater, Vulcano Island (Italy) 41
Cioni R → Chiodini G 321, 380
Connor CB → Taran YA 441
Coradossi N, Garavelli A, Salamida M, Vurro F: Evolution of Br/Cl ratios in fumarolic salammoniac from Vulcano (Aeolian Islands, Italy) 310
Corsaro RA, Cristofolini R, Patanè L: The 1669 eruption at Mount Etna: chronology, petrology and geochemistry, with inferences on the magma sources and ascent mechanisms 348
Cristofolini R → Corsaro RA 348
Cronin SJ, Wallace RC, Neall VE: Sourcing and identifying andesitic tephras using major oxide titanomagnetite and hornblende chemistry, Egmont volcano and Tongariro Volcanic Centre, New Zealand 33
D'Alessandro W, Giammanco S, Parello F, Valenza M: CO_2 output and $\delta^{13}C(CO_2)$ from Mount Etna as indicators of degassing of shallow asthenosphere 455
D'Alessandro W → Chiodini G 51
Day S → Pérez-Torrado FJ 647
Denlinger R → Keszthelyi L 5
De Rosa R, Mazzuoli R, Ventura G: Relationships between deformation and mixing processes in lava flows: a case study from Salina (Aeolian Islands, Tyrrhenian Sea) 286
Dingwell DB → Alidibirov M 411
Dingwell DB → Stevenson RJ 298
Dudoignon P, Proust D, Gachon A: Hydrothermal alteration associated with rift zones at Fangataufa atoll (French Polynesia) 583
Elliot DH → Hanson RE 327
Ellwood BB → Palmer HC 101
Espíndola JM → Macías JL 459
Fierstein J → Hildreth W 472
Froggatt PC → Black TM 226
Frondini F → Chiodini G 41
Frullani A → Chiodini G 380
Gachon A → Dudoignon P 583
Garavelli A → Coradossi N 310
Garcia MO, Rhodes JM, Trusdell FA, Pietruszka AJ: Petrology of lavas from the Puu Oo eruption of Kilauea Volcano: III. The Kupaianaha episode (1986–1992) 359
Gardeweg MC → Sparks RSJ 557
Gardner JE, Thomas RME, Jaupart C, Tait S: Fragmentation of magma during Plinian volcanic eruptions 144
Giammanco S → D'Alessandro W 455
Gilbert JS, Stasiuk MV, Lane SJ, Adam CR, Murphy MD, Sparks RSJ, Naranjo JA: Non-explosive, constructional evolution of the ice-filled caldera at Volcán Sollipulli, Chile 67
Gromme CS → Palmer HC 101
Guidi M → Chiodini G 380
Hammond SR: Offset caldera and crater collapse on Juan de Fuca ridge-flank volcanoes 617
Hanson RE, Elliot DH: Rift-related Jurassic basaltic phreatomagmatic volcanism in the central Transantarctic Mountains: precursory stage to flood-basalt effusion 327
Harris DM, Rose WI: Dynamics of carbon dioxide emissions, crystallization, and magma ascent: hypotheses, theory, and applications to volcano monitoring at Mount St. Helens 163
Heiken G, Johnson W (Editorial): IAVCEI Personal Membership 2
Higgins MD: Crystal size distributions and other quantitative textural measurements in lavas and tuff from Egmont volcano (Mt. Taranaki), New Zealand 194
Hildreth W, Fierstein J: Recent eruptions of Mount Adams, Washington Cascades, USA 472
Hole MJ → Smellie JL 628
Houghton BF, Wilson CJN, Rosenberg MD, Smith IEM, Parker RJ: Mixed deposits of complex magmatic and phreatomagmatic volcanism: an example from Crater Hill, Auckland, New Zealand 59
Hulsebosch T → Thordarson Th 205
Hurwitz S → Lyakhovsky V 19
Ishiwatari A → Toramaru A 393, 655
Jansma PE → Mattioli GS 401
Jaramillo L → Mattioli GS 401
Jaupart C → Gardner JE 144
Jaupart C → Stasiuk MV 117
Johnson W → Heiken G 2
Kano K: A Miocene coarse volcaniclastic mass-flow deposit in the Shimane Peninsula, SW Japan: product of a deep submarine eruption? 131
Keszthelyi L, Denlinger R: The initial cooling of pahoehoe flow lobes 5
King AJ → Self S 263

5 672HI XL 2224
1/98 31249-200 NULE

Klug C, Cashman KV: Permeability development in vesiculating magmas: implications for fragmentation 87
Kurszlaukis S, Lorenz V: Volcanological features of a low-viscosity melt: the carbonatitic Gross Brukkaros Volcanic Field, Namibia 421
Landi P → Bertagnini A 239
Lane SJ → Gilbert JS 67
Lorenz V → Kurszlaukis S 421
Lorenz V → Zimanowski B 491
Lyakhovsky V, Hurwitz S, Navon O: Bubble growth in rhyolitic melts: experimental and numerical investigation 19
MacDonald WD → Palmer HC 101
Macías JL, Sheridan MF, Espíndola JM: Reappraisal of the 1982 eruptions of El Chichón Volcano, Chiapas, Mexico: new data from proximal deposits 459
Mangas J → Pérez-Torrado FJ 647
Marini L → Chiodini G 321, 380
Martí J → Pérez-Torrado FJ 647
Matsuzawa M → Toramaru A 393, 655
Matthews SJ → Sparks RSJ 557
Mattioli GS, Jansma PE, Jaramillo L, Smith AL: A desktop image processing and photogrammetric method for rapid volcanic hazard mapping: application to air-photo interpretation of Mount Pelée, Martinique 401
Mazzuoli R → De Rosa R 286
Murphy MD → Gilbert JS 67
Murray JB → Stevens NF 449
Nakamura M → Toramaru A 655
Nakamura N → Toramaru A 393
Nappi G → Capaccioni B 501
Naranjo JA → Gilbert JS 67
Navon O → Lyakhovsky V 19
Neall VE → Cronin SJ 33
Óskarsson N → Thordarson Th 205
Ovsyannikov AA → Taran YA 441
Palmer HC, MacDonald WD, Gromme CS, Ellwood BB: Magnetic properties and emplacement of the Bishop tuff, California 101
Panichi C → Chiodini G 321
Parello F → Chiodini G 51
Parello F → D'Alessandro W 455
Parker RJ → Houghton BF 59
Pasternack GB, Varekamp JC: Volcanic lake systematics I. Physical constraints 528
Patanè L → Corsaro RA 348
Pérez-Torrado FJ, Martí J, Mangas J, Day S: Ignimbrites of the Roque Nublo group, Gran Canaria, Canary Islands 647
Pietruszka AJ → Garcia MO 359
Prati F → Chiodini G 380
Presley TK, Sinton JM, Pringle M: Postshield volcanism and catastrophic mass wasting of the Waianae Volcano, Oahu, Hawaii 597
Pringle M → Presley TK 597
Proust D → Dudoignon P 583
Raco B → Chiodini G 41, 380
Ratté JC → Stasiuk MV 117
Rhodes JM → Garcia MO 359
Rocchi MBL → Capaccioni B 501
Rose WI → Harris DM 163
Rosenberg MD → Houghton BF 59
Rothery DA → Wooster MJ 566
Russel JK, Stasiuk MV: Characterization of volcanic deposits with ground-penetrating radar 515
Salamida M → Coradossi N 310
Sarocchi D → Capaccioni B 501
Schmincke H-U, Swanson DA (Editorial): Ten years of the Bulletin of Volcanology: taking stock and looking ahead 1
Self S, King AJ: Petrology and sulfur and chlorine emissions of the 1963 eruption of Gunung Agung, Bali, Indonesia 263
Self S → Thordarson Th 205
Shane PAR → Black TM 226
Shapar VN → Taran YA 441
Sharp TG → Stevenson RJ 298
Sheridan MF → Macías JL 459
Sinton JM → Presley TK 597
Smellie JL, Hole MJ: Products and processes in Pliocene-Recent, subaqueous to emergent volcanism in the Antarctic Peninsula: examples of englacial Surtseyan volcano construction 628
Smith AL → Mattioli GS 401
Smith IEM → Houghton BF 59
Sparks RSJ, Gardeweg MC, Calder ES, Matthews SJ: Erosion by pyroclastic flows on Lascar Volcano, Chile 557
Sparks RSJ → Calder ES 432
Sparks RSJ → Gilbert JS 67
Sparks RSJ → Stasiuk MV 117
Stasiuk MV, Barclay J, Carroll MR, Jaupart C, Ratté JC, Sparks RSJ, Tait SR: Degassing during magma ascent in the Mule Creek vent (USA) 117
Stasiuk MV → Gilbert JS 67
Stasiuk MV → Russel JK 515
Stevens NF, Murray JB, Wadge G: The volume and shape of the 1991–1993 lava flow field at Mount Etna, Sicily 449
Stevenson RJ, Dingwell DB, Webb SL, Sharp TG: Viscosity of microlite-bearing rhyolitic obsidians: an experimental study 298
Swanson DA → Schmincke H-U 1
Tait S → Gardner JE 144
Tait SR → Stasiuk MV 117
Takada A: Cyclic flank-vent and central-vent eruption patterns 539
Taran YA, Connor CB, Shapar VN, Ovsyannikov AA, Bilichenko AA: Fumarolic activity of Avachinsky and Koryaksky volcanoes, Kamchatka, from 1993 to 1994 441
Thomas RME → Gardner JE 144
Thordarson Th, Self S, Óskarsson N, Hulsebosch T: Sulfur, chlorine, and fluorine degassing and atmospheric loading by the 1783–1784 AD Laki (Skaftár Fires) eruption in Iceland 205
Toramaru A, Ishiwatari A, Matsuzawa M, Nakamura M, Arai S: Corrections to Vesicle layering in solidified intrusive magma bodies: a newly recognized type of igneous structure 655
Toramaru A, Ishiwatari A, Matsuzawa M, Nakamura N, Arai S: Vesicle layering in solidified intrusive magma bodies: a newly recognized type of igneous structure 393
Trusdell FA → Garcia MO 359
Valentini L → Capaccioni B 501
Valenza M → D'Alessandro W 455
Varekamp JC → Pasternack G 528
Ventura G → De Rosa R 286
Vurro F → Coradossi N 310
Wadge G → Stevens NF 449
Wallace RC → Cronin SJ 33
Webb SL → Stevenson RJ 298
Westgate JA → Black TM 226
White JDL: Pre-emergent construction of a lacustrine basaltic volcano, Pahvant Butte, Utah (USA) 249
Wilson CJN → Houghton BF 59
Woods AW → Bursik MI 175
Woods AW → Calder ES 432
Wooster MJ, Rothery DA: Thermal monitoring of Lascar Volcano, Chile, using infrared data from the along-track scanning radiometer: a 1992–1995 time series 566
Zimanowski B, Büttner R, Lorenz V: Premixing of magma and water in MFCI experiments 491
Book review 500
GVN 84, 246, 323, 417, 496, 580, 657

SUBJECT INDEX FOR VOLUME 58 (1996–1997)

(Page numbers written boldface refer to key words given at the beginning of papers. Figures and tables are regarded only when containing words or volcano names not mentioned in the text.)

1669 eruption (Etna) **348**
1991–1993 eruption (Etna) **449**

a'a 6, 71, 450
abrasion feature 560
accretionary clast 258
accretionary lapilli 239, 336, 632, 651
acid leaching 242
acid-water/rock interaction 528
advanced argillic alteration 382
aerial photogrammetry 453
aerial photography **401**
aeromagnetism 585
aerosol 205, 263
aerosol optical depth 279
agglutinate 341, 635
agglutinated spatter 476
airfall tuff 328, **515**
albite 133
alkali basalt 614
alkalic lava **597**
alunite 242, 382
amorphous silica 119, 242
amphibole 73, 170, 197, 293
analcite 242
andesite 132, 145, 195, 264, 402, 441, 472, 539, 544, 559
andesitic dome 381
andesitic shield 474
andesitic tephra identification 33
anhydrite 320, 322
anisotropy of magnetic susceptibility (AMS) 101
apatite 72, 242, 601
argon-argon age 329
armored lapilli 253, 333, 462
ash **87**
ash cloud 139, 464
ash flow **175**
ashfall 71, 567
ash-flow tuff 101, 139
atmospheric pollution 205
ATSR (Along Track Scanning Radiometer) **566**
augite 267, 586
autobreccia 519

Bandai-type eruption 244
banding 287
barite 242
basalt **59**, 70, 145, 207, 287, 402, 442, 472, 515, 539, 542, 584, 597, 631, 647
basaltic andesite 70, 196, **263**, 287
basaltic bomb 337
basaltic lava alteration 583
basaltic phreatomagmatic volcanism **327**
basaltic shield volcano 542
basaltic volcanism **249**
basanite 614, 648
base surge 336
bathymetric data 621
beidellite 586
benmoreite 614
Bezymianny-type eruption 244
biotite 121, 242, 601
block and ash flow 264, 403, 515
block sags 253
boudin-like structure 287
Bouguer anomaly 78
Bouma divisions 139
breccia pipe 128
brine 51
brittle deformation structure 287
bromine content **310**
bromine/chlorine ratio 310
bubble **87**
bubble coalescence 87, 127
bubble connectivity **144**, 155
bubble flattening 127
bubble growth 19
bubble growth simulation 24
bubble nucleation **393**
bubble number density 20
bubble overlap 127
bubble relaxation 95
bubble shape 87, 125
bubble-size distribution 22, 87
bubble wall rupture 88
bubble-bubble interaction 90

calc-alkaline rocks **286**
calcedony 594
calcite 331, 586
caldera **67**, 226, 598, **617**
caldera collapse 79
caldera formation 68
canonical discriminant function 33
carbon dioxide (CO$_2$) **41**, 51, 87, **163**, 209, 383, 455, 584
carbon dioxide output **455**
carbon isotopes 45, 457, 584
carbonatite **421**
carbonatite dyke 423
carbonatite sill 425
catastrophic collapse 244
cauliflower bomb 252, 559
celadonite 331
central eruption **539**
central eruption phase 540
characteristic remanence 101
chemical analyses, alteration products 589
chemical analyses, gas 53, 382, 443
chemical analyses, glass 124, 210, 233, 272, 293
chemical analyses, mineral 35, 270, 354, 365
chemical analyses, rock 241, 267, 293, 351, 366, 478, 607
chemical analyses, sublimate 313
chemical analyses, water 52, 383
chlorine (Cl) 206, 264, 442
chlorite 133
chlorite/saponite mixed layer **583**
cinder cone 482
circular statistics **501**
clast density 62
clay minerals 382, **583**
clinopyroxene 34, 72, 197, 207, 242, 293, 350, 364, 395
clinopyroxenite 601
CO/CO$_2$ ratio 442
CO$_2$/H$_2$O 46
coarse pumice **131**
co-ignimbrite ash 187
co-ignimbrite cloud 432
co-ignimbrite cloud, discrete 438
co-ignimbrite eruption column **175**
co-ignimbrite plume **432**
co-ignimbrite plume, steady 436
collapse structures 617
collapsing fountain 432, 469
column collapse 469
columnar joint 72, 195, 394, 519
compound lava 638
conduction of heat 10
continuous-uprush eruption 628
convective cooling 8
cooling (of lava) **5**
correlation (of ignimbrites) **226**
correlation spectrometry (COSPEC) 42, 455, 530
crack interactions **539**
crater **617**
crater lakes **528**
cross stratification 251, 336
crystal fractionation 360
crystal orientation **194**, 202
crystal shape **194**
crystal size distribution (CSD) **194**
crystallization 164, **317**
cummingtonite 482
Curie temperature 101
cyclic eruptive behavior **539**

dacite 70, 145, 271, 287, 402, 474, 520
debris avalanche 381
debris avalanche deposit 488
debris flow 241, 335, 598
Deccan basalt 327
decompression **411**
degassing 117, 144
degassing, open system 126
degassing, closed system 126
dense underflow 176
desktop image processing and photogrammetric method 401
devitrification 129, **317**
diatreme **421**
dielectric constant **515**
diffuse carbon dioxide (CO$_2$) flux 41, 456
diffusion **393**, 655
diffusion-limited heat transfer 163
digital elevation model (DEM) 452
dike (dyke) 71, 362, 474, **539**, 583, 598, 639, **421**
diktytaxitic texture 72

dioctahedral aluminous smectite 583
directional indicator 101
discriminant function analysis **33**
dispersive pressure 138
distribution anisotropy 114
dome collapse 576
dome growth 558
double graded bed 139
drill core 600
drill hole 584
dune bedforms 254
dunite 601

earthen barrier 450
east rift zone 362
effusion rate 348
effusive activity 349
effusive basaltic volcanism **205**
electromagnetic (EM) wave 516
electron microprobe 35, 208, 232, 266, 294, 349, 364, 584
emergent volcanism 628
enclave 287
englacial 67, **628**
equilibrium degassing 19
erosion (by glacier) 474
erosion (by pyroclastic flow) **557**
erosional furrow 562
eruption dynamics **205**
eruption forecasting **163**
eruption mechanism 63
eruption transitions **117**
eruption trigger 362
eruptive fissure system 363
eruptive pause 363
experimental (magma fragmentation) **411**
experimental volcanology **491**
explosive eruption 19, **59**, **411**, **491**
explosive lava collapse **131**
extensional tectonism 328

feeder conduit 117
Fe-Ti oxide 107, 276
fiamme 75
filled crater 126
fire fountaining 65
fission track **226**
fissure eruption **205**, 360, **539**
fissure vent 482
flame structure 632
flank collapse **239**, 628
flank eruption **539**
flank eruption phase 540
flank vents 472
flank volcano 617
flood basalt 327
flow banding 121
flow direction 102, 140
flow dynamics 179
flow field 449
flow transformation 138
fluid chemistry **51**, **380**
fluidization 428
fluorine 206
forecasting activity 171
Fourier transform infrared spectroscopy (FTIR) 150
fractional crystallization 353, 609
fragmentation **87**, **411**
fuel-coolant interaction (FCI) 344, 491

fumarole 45, 53, 310, 441, 530
fumarole temperature 164
fumarolic activity 461
fumarolic condensate 444
fumarolic degassing 567
fumarolic fields 380
fumarolic fluids 41, **310**

gabbro 601
gas separation **51**
Gauss normal polarity chron 603
geobarometry 53, 275
geobarometry, gas 385
geochemical surveillance 41
geochronology **226**
geothermal gradient 595
geothermal potential 380
geothermometer, CO-CO$_2$ -CH$_4$ 55
geothermometer, Na-K-Mg 55
geothermometry 53, 214, 276, **583**
geothermometry, gas 385
glacier 69, 628
glass inclusion **263**
glass transition 88, **298**
glassy breccia 628
Global Positioning System (GPS) 451
grading, normal 138, 251, 333, 461, 632, 649
grading, reverse 138, 145, 251, 333, 464, 632, 649
grain-size distribution **501**
granulometric analyses 465
gravitational collapse 140
gravity **67**
ground deformation 363
ground surveying 453
ground-penetrating radar (GPR) **515**
growth history 621

hackly joints 72
Harker diagram 352
hawaiian 61
hawaiite 350, 584, 597
hazard mapping 402
hazards 528
He/CO$_2$ 45
heat flow **528**
helium (He) 45, 51
helium isotopes 385
hematite 107, 331
hornblende 34, 195, 267, 482
hyaloclastite delta 628
hyaloclastic breccia 73, 586, **628**
hybrid magma 286
hydrated iron oxide 242
hydration 125
hydraulic jump **432**
hydrogen chloride (HCl) 45
hydrogen fluoride (HF) 45
hydrogen sulfide (H$_2$ S) 42
hydromagmatic 511
hydromagmatic eruption 468, 491, 511
hydrothermal alteration **583**
hydrothermal eruption 380
hydrothermal fluids **380**
hydrothermal system **51**, **528**, **617**
hydrovolcanic eruptions 331, **647**
hydrovolcanic fragmentation 257
hydrovolcanism **249**

ice **67**, 628
igneous layering **393**
ignimbrite 75, **226**, 317, 501, 559, 648
ilmenite 72, 114
image analysis **501**
imbrication 101, 140
impact mark 560
impact sag 463
impact structure 634
inductively coupled plasma emission (ICP) 349
infrared **560**
infrared spectrophotometery 164
infrared spectroscopy 125
initial cooling of pahoehoe 5
instrumental neutron activation analysis (INAA) 349
intrusive ring complex 421
IR spectrophotometer 42, 455
island arc **401**
isothermal plateau fission-track (ITPFT) method 227

Kaena reversed polarity Subchron 603
kaolinite 382
K-Ar age 474, 601, 630
Karoo lavas 327
K-feldspar 242
Kirkpatrick flood basalt **327**
Kuiper's test 505

laccolithic magma reservoir 421
lag breccia 138, 562
lahar 264, **327**, 333, 461
Landsat Thematic Mapper (TM) 402, 567
landslide 614
lapilli tuff 133
latent heat of crystallization 9
lava **5**, **515**
lava apron 474
lava compositions **348**
lava dome 70, 117, 159, 461, 567
lava flow (lavas) 5, 69, **286**, **472**, 597
lava flow complex 472
lava flow cooling 5
lava flow field dimensions 452
lava flow lobe 6
lava flow structures 286
lava flow rheology **298**
lava flow thickness 451
lava flow volume 449
lava fountaining 65, 140, 205
lava geochemistry **359**
lava pond 363
lava shield 59, 363
lava stream 450
lava tube 6, 363
lead isotopes 361
leucite 242
leucoxene 331
Li/Cl 52
Liesegang ring **393**
lithic clast 133. 241, 462, 506, 559, 650
lithic ejecta 265
lithofacies **628**
low-angle cross-stratification 463

maar 61, 427
maghemite 114
magma **359**

magma ascent 117, 164
magma ascent rate 170
magma body replenishment **163**
magma chamber **194**
magma crystallization rates **163**
magma degassing **205**, **455**
magma discharge 207
magma fragmentation **144**
magma mixing 169, **263**, 274, 360
magma residence time 199, 376
magma sources **348**
magma storage history 170
magma supply rate 168, 362, 539
magma vesiculation 411
magma viscosity 87
magmatic **59**
magmatic fluids **380**
magmatic plumbing system 362
magma-water interaction 59, 249, 343, 652
magnetic anisotropy 103
magnetic property variation 106
magnetic susceptibility (AMS) 501
magnetite 114, 424
mantle melting **359**
mantle plume 345
mass crystallization rate 167
mass eruption rate 177
mass flux of eruption 151, 177
mass spectrometer 349
mass wasting 611, 623
Maxwell's formula 16
Mazama ash 483
methane (CH_4) 51, 383, 442
Mexican active volcanoes **459**
Mg/Cl 52
microbreccia 124
microlites **298**
mingled lava 72
mixed magma 197
mixing of ejecta 59
mixing/mingling processes **286**
molten-fuel-coolant interaction (MFCI) 491
monitoring volcanoes 171
mud volcanoes **51**
mudflow 600
mudflow deposit 520
mugearite 598

Na-Cl brine 51
natural remanent magnetism (NRM) 229
neodymium isotopes 361
nephelinite 648
nontronite 586
nucleated autolith 427
Nusselt Number 8

obsidian 74, **298**, 523
oceanite 584
off-axis magmatic processes 617
offset caldera and crater 621
olivine 34, 71, 197, 207, 242, 267, 287, 363, 395, 476, 586, 598
opal 594
ore-depositing magmatic/ hydrothermal systems 528
orthopyroxene 72, 267, 293, 482
Ostwald's supersaturation theory 397
oxidation 125
oxygen fugacity 276
oxygen isotopes 319, 321, 390, 444, 584

pahoehoe **5**, 450, 638
palagonite 331, 632
palagonitic breccia 71
paleomagnetic excursions 235
paleomagnetism **226**
paleomagnetic inclination 103
parallel-plate viscometry 302
Paraná-Etendeka volcanics 327
parasitic eruption 354
partial melting 610
parting lineation 135
Peclet number 20
pelean 402
pelletal lapilli 427
peperite **327**, 652
peripheral vent 474
permeability **87**, **117**, 127
permeable foam 127, 140, 568
permeable magma fragments 153
petrologic estimate of volatiles 215, 277
petrology **263**, 348, 359, **597**
phlogopite 424
Phoenix cloud **175**
phonolite 151, 647
photogeologic unit 408
phreatic eruption 461, 468
phreatomagmatic **59**
phreatomagmatic disruption 251
phreatomagmatic eruption 140, **239**, 328, **459**, 491, 644
phreatomagmatic tephra 212, 478
phreatomagmatism **421**, 428
phyllosilicate 242
pillow lava 71, 628
plagioclase 34, 72, 118, 132, 196, 207, 227, 242, 251, 267, 287, 350, 364, 395, 482, 586, 601
plinian eruption 140, 144, 175, 402, 460, 647
plinian fall deposit 73, 118
plume ascent **348**
plume generation 432
polygenetic volcano 539
post-caldera eruption 80
postfragmentation processes 158
postglacial eruption **472**
postshield volcanism **597**
Potter-Stephenson effect 109
pre-eruption water content 125
premixing conditions **491**
primary vesicle 124
primary void fraction 124
principle component analysis 35
Pu'u 'O'o eruption 359
pumice 74, **87**, 132, 144, 461, 506, 515, 558
pumice density 147
pumice vesicularity **144**
pyrite 132, 242
pyroclastic deposit 59, 73, 87, **239**, 381, 402, 411, **501**, 515
pyroclastic breccia 120
pyroclastic density current 176
pyroclastic fallout 460
pyroclastic flow 264, 317, 432, 460, **515**, **557**, 574, **647**
pyroclastic flow deposit 73, 175, 402, 520
pyroclastic flow emplacement 101
pyroclastic flow turbulence 564
pyroclastic flows, erosional effects 557
pyroclastic intrusion 342
pyroclastic sill 342
pyroclastic surge 460
pyroclastic surge cloud (minimum velocity) 468
pyroclastic surge deposit 402
pyroxene 251, 287, 586
pyrrhotite 269

quartz 121, 133, 559, 586

radar **67**, 402, 515
radar velocity **515**
radiometer 6
Rayleigh Number 8
Rayleigh test 504
remote sensing **560**
reservoir volume 376
residence time **194**
reticulite 146
rheology 298
rhyodacite 145
rhyodacitic breccia 559
rhyolite 19, **117**, 132, 145, 232, 287, **298**
Richardson number 178
ridge flank volcanism 623
ridge-and-valley fabric 617
rift zone 359, 540, 598
ring fault 80
rolling structure 287
rootless-cone tephra 212
Roque Nublo ignimbrites **647**
run-out distance of ash flow **175**
rutile 107

sag structure 632
salammoniac **310**
sandwave 463
sanidine 227
saponite 583
scanning calorimetry 303
scanning electron microscope (SEM) 88
scoria 71
scoria cone 59, 476
sea floor **617**
sea-floor spreading 617
secondary ion mass spectrometry (SIMS) 150
sector collapse 244
sediment gravity flow 628
sedimentation 180
sediment-gravity flow **249**
seismic reflection 585
seismicity 348, 381, 552
shape (of 1991-1993 Etna flow) **449**
shape-fabric **501**
shear **117**, 286
shield-building stage 597
shock wave 176
shock-tube technique 412
shortwave infrared (SWIR) radiation 566
shoshonite 239
siderite 587

sideromelane **249**, 331, 632
sill 71, 393
sillar 317, 509
sillar ocioso **317**
simple lava flow 475
sinter deposit 382
slump 598
smectite 331, 651
SO_2 -H_2 S equilibrium 442
soil degassing **41**
somma crater 461
spatter 341
spatter and cinder cone 360
spectroradiometer 6
sphene 121
spreading center **617**
St. Vincent type 402
steam condensation processes 45
steam cupola 259
stereology 502
stevensite 587
strain analysis **286**
stratigraphy **515**
stratovolcano **472**
striation 560
strombolian activity 61, 239, 476, 648
strombolian fall 207
strontium isotope 352. 361
subaqueous explosion 257
subaqueous lava dome 140
subaqueous pyroclastic flow deposit 131
subaqueous volcaniclastic mass-flow deposit 131, 632
subaqueous volcanism **249**, 628
subcritical ash flow 186
subglacial eruptions **67**, 628
sublimates **310**
submarine eruption **131**
submarine landslide **597**
submarine lava flow 583
submarine volcano 617
sub-plinian 264
sulfate aerosol **263**
sulfur (S) 264, 383
sulfur dioxide (SO_2) 42, 87, 163, 206, 263, 455, 530
summit eruption **539**
supercritical **175**
supercritical ash flow 184
surface tension 20
surtseyan volcanism **249**, **628**
suspension **131**
temporal geochemical variation 371
tephra 33, 118, 146, 206, 250, 264, 345, 349, **472**, 502, 515, 558, 628
tephra jets 250
tephric phonolite 145
tephrostratigraphy **33**
theoretical models **432**
thermal conductivity 10
thermal radiation 7
thermal spring 380
thermal water **41**
thermocouple 6
tiltmeter 362
titanomagnetite 33, 72, 114, 197, 230, 267, 350
topographic mapping **449**
topography **432**
trachyte 584, 597, 647
traction **131**
traction structure 138
transmission electron microscopy (TEM) 302
tuff 194
tuff breccia 133
tuff cone 249
tuff ring 59, 287
tuffisite **117**
Tukey test 504
turbidite 138
turbulent flow 138
turbulent suspension 176

upwarped mantle 457

vapor-liquid separation **441**
vent **117**
vent migration 539
vesicle layering **393**, 655
vesicle shape 89
vesicle size distribution 89
vesicularity 89, 145
vesiculated tuff 243
vesiculation **87**
viscosity 19, 87, 144, 286, **298**, 421
viscous deformation 147
vitrophyre 120
vitrophyre breccia 120
volatiles **117**
volatiles **263**
volcanic activity **455**
volcanic aerosols **205**
volcanic atoll **583**
volcanic degassing **528**
volcanic deposits **515**
volcanic eruptions **144**
volcanic flow model **175**
volcanic gases **163**, **205**, **441**
volcanic glass chemistry **205**
volcanic hazard **175**, **401**
volcanic lake 528
volcanic lake hazard assessment 535
volcanic MFCI **491**
volcanic surveillance **41**, **51**
volcanic/hydrothermal heat flux 528
volcaniclastic 631
volcaniclastic mass flow **131**
volcanism **628**
volcano **617**
volcano growth 539, 617
volcano hazards **472**
volcano life cycle 625
volcano monitoring **163**
volcano monitoring tool 566
volcano morphology 621
volcano plumbing **359**
volcano stability 624
volcano/atmosphere interactions **163**, 205
volume (of 1991-1993 Etna flow) **449**
volume (of Mount Adams) 474
volume (of sea-floor volcanoes) 621
Von Mises distribution 505
vulcanian activity 264, 558, 567, 648

water (H_2O) 41, 87, 150, 209, 383
water content in melt 276
water/magma ratio 63
water/rock interaction 583
water-melt interaction **491**
water-saturated surge 466
welding 73, 105, 121, 189, 227, 317, 509, 560
wet and dry surge deposits **459**
wet surge 467

X-ray diffraction (XRD) 584
X-ray fluorescence (XRF) 266, 349, 365

zeolite 583, 651
zeolite-facies alteration 331
zeolitization 506, 652

NOTE: Each key word and location name is given only once per article, in the place where it appears for the first time.

LOCATION INDEX FOR VOLUME 58 (1996–1997)

(Page numbers written in italics refer to reports of the Smithsonian's Global Volcanism Network, those written boldface refer to key words given at the beginning of most papers. Figures and tables are only regarded when containing location names not mentioned in the main text.)

Adatara volcano (Japan) *247, 418*
Aeolian island arc (Italy) **41**
Aeolian Islands **286**
Aguas Calientes volcano (Chile) 562
Agung volcano (Indonesia) **263**
Akademii Nauk caldera (Kamchatka) *86*
Akan caldera (Japan) *419*
Akutan volcano (Alaska) *85, 86, 247, 325*
Alaid volcano (Kurile Islands) *499*
Alpehué crater (Chile) 67
Amboy flow field (California) 8
Ambrym volcano (Vanuatu) *497*
Anak Krakatau volcano (Indonesia) *497*
Andes 68
Antarctic **628**
Antarctic Peninsula 629
Arenal volcano (Costa Rica) *86, 324, 325, 419, 497, 499, 658*
Asama volcano (Japan) *418, 498*
Askja caldera (Iceland) 81
Aso volcano (Japan) *324, 418*
Atka volcano (Alaska) *325*
Auckland volcanic field (New Zealand) 59
Avachinsky (Avacha) volcano (Kamchatka) *326*, **441**
Axial seamount 617
Azuma volcanic field (Japan) *324, 418*

Bali **263**
Beerenberg volcano (Jan Mayen Island) *659*
Ben Lomond dome (New Zealand) 299
Bezymianny volcano (Kamchatka) *326, 418, 499*
Big Glass Mountain (California) 299
Big Lava Bed (Washington) 473

Calbuco volcano (Chile) *497*
Callaqui volcano (Chile) *658*
Canary Islands **647**
Canlaon volcano (Philippines) *417*
Cascade arc 472
Castle Peak dome (Montserrat) *84*
Central America volcanic arc 460
Central Volcanic Zone (Chile) 68
Cerro Negro volcano (Nicaragua) *247, 324, 498, 499*
Chiapanecan volcanic arc (Mexico) 459
Chichón Volcano (Mexico) **459**
Chile **557**
Colima volcano (Mexico) *246*
Concepción volcano (Nicaragua) *496*
Copahue volcano (Chile) *658*
Crater Hill (New Zealand) **59**
Crater Lake (USA) 81

Dairy Creek obsidian (Idaho) 299
Deception Island (Antarctica) *247*
Dome Mountain (Nevada) 202
Dondaro Caldera (Indonesia) *246*
Duke of Gloucester's atoll 584

East Molokai volcano (Hawaii) 612
East Rift Zone (Iceland) *496*
Eastern Gemini Seamount (Vanuatu) *84*
Egmont volcano (New Zealand) **33**, 194
El Chichón volcano (Mexico) 263, 459
Eldgjá-Lakagigar volcano (Iceland) 541
Erevan Dry Fountain obsidian (Armenia) 299
Etna volcano (Italy) **51**, *86, 325*, **348**, *418*, **449**, 455, *539, 658*

Fangataufa atoll (French Polynesia) 583
Fanthams Peak cone (Egmont volcano, New Zealand) 39, 195
Fernandina caldera (Galapagos, Ecuador) 81
Ferrar province (Antarctica) **327**
Fogo volcano (Azores) 146
Forgia Vecchia (Vulcano, Italy) 41
Fossa crater (Vulcano, Italy) 41, 310
Fossa delle Felci volcano (Italy) 287
Fuego volcano (Guatemala) *499*
Fuji volcano (Japan) 539
Fukutoku-okanoba submarine volcano (Japan) *86, 247, 323, 581*

Galeras volcano (Colombia) *247, 325, 658*
Gaua volcano (Vanuatu) *497*
Gibeon Kimberlite Field (Namibia) 421
Goat Rocks volcano (Washington) 473
Gorda Ridge spreading ridge (NE Pacific Ocean) *84, 325*
Gran Canaria **647**
Great Rift (Idaho) 541
Grímsvötn volcano (Iceland) *496*
Gross Brukkaros (Namibia) **421**
Guallatiri volcano (Chile) *418*
Gunung Agung volcano (Indonesia) 263

Haleakala volcano (Hawaii) 614
Hawaii **5, 359**
Heard Island (Indian Ocean) *580*
Hekla volcano (Iceland) 539
Hereheretue atoll 584
Huaynaputina center (Peru) *417*

Iliamna volcano (Alaska) *419, 497*
Irazú volcano (Costa Rica) *86, 419, 581*
Irruputuncu volcano (Chile) *580*
Iwate volcano (Japan) *86, 324, 418, 419, 498*
Iwo-jima volcano (Japan) *247*
Izu-Ogasawara arc (Japan) 88
Izu-Oshima volcano (Japan) 539
Izu-Tobu volcanic field (Japan) *418, 498, 657*

Juan de Fuca **617**

Kalaupapa Peninsula volcano (Hawaii) 614
Kamchatka **441**
Kameni volcano (Greece) 201
Kamoamoa flow field (Kilauea volcano, Hawaii) 12
Karengetang volcano (Indonesia) *498*
Karymsky volcano (Kamchatka) *85, 86, 323, 326, 419, 497, 499, 658, 659*
Kavachi volcano (Solomon Islands) *580*
Keli Mutu lakes (Indonesia) 528
Kelut volcanic lake (Indonesia) *498*, 529
Kikai caldera (Japan) 141
Kilauea volcano (Hawaii) 5, *86*, 141, 201, *324*, **359**, *418, 497, 498*, 539, *580, 657, 658*
Kliuchevskoi volcano (Kamchatka) *326, 419, 499*, 539, *658, 659*
Kohala volcano (Hawaii) 612
Komaga-take volcano (Japan) *84, 86, 324*
Koolau volcano (Hawaii) 598
Koryaksky (Koryak) volcano **441**
Krafla volcano (Iceland) 539
Krakatau (Indonesia) 81, 263, *497, 498*
Kuchinoerabu-jima volcano (Japan) *86, 247, 324, 418, 419*
Kuju volcanic field (Japan) *86, 247, 324, 418, 419, 498, 581*
Kupaianaha vent (Kilauea volcano, Hawaii) 5, 360
Kusatsu-Shirane volcano (Japan) *418*

La Palma volcano (Canary Islands) *325*
La Soufriere volcano (St. Vincent) 530
Laguna Calientes (Poás volcano, Costa Rica) 533
Laki (Iceland) **205**
Langila volcano (Papua New Guinea) *86, 247, 324, 325, 418, 419, 497, 499, 581, 657*
Las Pilas volcano (Nicaragua) *247*
Lascar volcano (Chile) *418*, **557, 566**
Latera Volcanic Complex (Italy) 506
Lesser Antilles **401**
Llaima volcano (Chile) 67, *658*
Loihi seamount (Hawaii) *417, 497*
Lokon-Empung volcano (Indonesia) *498*
Long Valley caldera (California) 101, *247, 325*
Lonquimay volcano (Chile) *658*
Lopevi volcano (Vanuatu) *497*

Maderas volcano (Nicaragua) *496*
Manam volcano (Papua New Guinea) *86, 247, 324, 325, 418, 419, 497, 499, 581, 657, 658*
Mangakino caldera (New Zealand) 227
Mars 5
Masaya volcano (Nicaragua) 146, *247, 324, 658*
Mauna Kea volcano (Hawaii) 614
Mauna Loa volcano (Hawaii) 5, 539
Mayor Island (New Zealand) 299
Me-Akan volcano (Japan) *581*
Merapi volcano (Indonesia) *419*
Minami-Iwo-jima volcano (Japan) *247*
Momotombo volcano (Nicaragua) *246, 498*
Monowai seamount (Kermadec Islands) *498*
Montaña Blanca volcano (Canary Islands) 146
Montserrat Island (West Indies) **380**
Mount Adams volcano (Washington) 472
Mount Cameroon volcano (Cameroon) *658*
Mount Everman volcano (Socorro Island, Mexico) *86*
Mount Hood volcano (Oregon) 473
Mount Lamington volcano (Papua New Guinea) 469
Mount Mazama volcano (Oregon) 88
Mount Meager volcano (British Columbia) 518
Mount Pelée (Martinique) **401**
Mount Pinatubo volcano (Philippines) 157
Mount Rainier volcano (Washington) 473
Mount Shasta volcano (California) 472
Mount St. Helens (Washington) **411**
Mount St. Helens volcano (Washington) 88, 145, 163, 186, *325*, **432**, 465, 473, 523, 562
Mule Creek vent (New Mexico) 117
Mururoa atoll (French Polynesia)
Mutnovsky volcano (Kamchatka) *499*
Myojin Knoll volcano (Japan) 140

Namibia **421**
Nasu volcanic field (Japan) *418*
Nevado del Ruiz (Colombia) *497*
Nevados de Chillan volcano (Chile) 81
New Hebrides island arc (Vanuatu) *84*
Newberry volcano (Oregon) 146
Nii-jima volcano (Japan) *418*
Novarupta lava dome (Alaska) 263

Obsidian dome (California) 88
Okataina Volcanic Centre (New Zealand) 228
Okmok volcano (Alaska) *581, 658, 659*
Ol Doinyo Lengai volcano (Tanzania) *247, 325, 497*
On-take volcano (Japan) *418*
Oshima volcano (Japan) *419*
Oshima-Oshima volcano (Japan) *86*

Pacaya volcano (Guatemala) *496, 498, 499, 659*
Pahvant Butte volcano (Utah) **249**
Pavlof volcano (Alaska) *418, 497, 499, 581*
Pinatubo volcano (Philippines) 263, 457
Pitcairn-Gambier Island chain 584
Piton de la Fournaise (Réunion Island) *499*, 539
Platanar volcano (Costa Rica) *658*
Poás volcano (Costa Rica) *86, 323, 325, 419, 499, 658*
Popocatépetl volcano (Mexico) *84, 85, 246, 419*, 457, *499, 658*
Porri volcano (Aeolian Islands, Italy) 286
Porto di Levante fumarole field (Vulcano, Italy) 41
Pu'u 'O'o vent (Kilauea volcano, Hawaii) 5, 359, *580, 657, 658*

Rabaul caldera (Papua New Guinea) 80, *86, 247, 323, 325, 417, 419, 497, 499, 580, 657*
Redoubt volcano (Alaska) 282
Reporoa caldera (New Zealand) 229
Reykjanes geothermal system (Iceland) 593
Rincón de la Vieja volcano (Costa Rica) *86, 419, 581*
Rivi-Capo volcano (Italy) 287
Ruang volcano (Indonesia) *419*
Ruapehu volcano (New Zealand) *247, 324, 325, 498*, 528
Ruiz volcano (Colombia) *324*

Sakura-jima volcano (Japan) *86, 324, 326, 418, 539, 581*
San Cristóbal volcano (Nicaragua) *499*
Sangay volcano (Ecuador) *86*
Santiaguito dome (Guatemala) *497, 499, 659*
Santorini volcano (Greece) 81, 145
Sciara del Fuoco (Stromboli, Italy) 239
Semeru volcano (Indonesia) *325, 419, 497, 498*
Serinci volcano (Indonesia) *498*
Sheveluch volcano (Kamchatka) *326, 419, 658, 659*
Shikotsu caldera (Japan) *418, 419*
Simeto mud volcano (Etna, Italy) 51
Slamet volcano (Indonesia) *498*
Sollipulli volcano (Chile) **67**
Somma-Vesuvius volcanic complex (Italy) *419*
Soputan volcano (Indonesia) *246, 419, 498*
Sorikmarapi volcano (Indonesia) *419*
Soufriere Hills volcano (Montserrat) *84, 86, 246, 324, 325*, **380**, *418, 419, 496, 498, 499, 581, 657, 658*
Southern Volcanic Zone (Chile) 68
Stadio mud volcano (Etna, Italy) 51
Stromboli volcano (Italy) **239**, *247, 324*, 457, *659*
Sulawesi volcano (Indonesia) *498*
Surtsey volcano (Iceland) 255
Suwanose-jima (Japan) *86, 326, 581*
Svartsengi geothermal system (Iceland) 593

Taranaki volcanic field (New Zealand) 194
Taupo caldera (New Zealand) 88, 189
Taupo volcanic zone (New Zealand) 33, **226**
Tavurvur volcano (Papua New Guinea) *86, 247, 323*, 325, *417, 419, 497, 499, 580, 657, 658*
Telica volcano (Nicaragua) *247, 659*
Tokachi volcano (Japan) *324*
Tongariro Volcanic Centre (New Zealand) **33**
Transantarctic Mountains **327**
Trans-Mexican volcanic belt 460
Turrialba volcano (Costa Rica) *419, 499*

Ubinas (Peru) *417*
Ulawun volcano (Papua New Guinea) *86, 324, 325*
Unzen volcano (Japan) *84, 86, 324*
Usu volcano (Japan) *324*

Valle del Bove (Etna) 449
Valles caldera (USA) 80
Valley of Ten Thousand Smokes (Alaska) 186
Vallone Salato mud volcano (Etna, Italy) 51
Vance Seamount Chain 617
Veidivötn volcano (Iceland) 541
Venus 5
Vesuvius volcano (Italy) 145, *325*
Villarrica volcano (Chile) 67, *418, 497, 499*
Volcán Chufquén (Chile) 67
Volcán Redondo (Chile) 67
Volcán Sollipulli (Chile) 67
Vulcan volcano (Papua New Guinea) *86, 419, 497*
Vulcano (Italy) **41**, *247*, 310, 319, 321, 465
Vulsini volcanic district (Italy) **501**

Waianae volcano (Hawaii) 597
West Crater volcano (Washington) 473
West Maui volcano (Hawaii) 614
White Island volcano (New Zealand) *247*, 457, *497, 498, 657*

Yasur volcano (Vanuatu) *419, 497*
Yellowstone caldera (USA) 80
Yellowstone-Snake River Plain (western USA) 226
Yugama Lake (Japan) 528

NOTE: Each key word and location name is given only once per article, in the place where it appears for the first time.

Supplement to Volume 58: S1–S132 (1996–1997)

Bulletin of Volcanic Eruptions, No. 33

Annual report of the world volcanic eruptions in 1993

Volcanological Society of Japan

International Association of Volcanology and Chemistry of the Earth's Interior

IUGG